Taxonomic overview of Eustoma (Gentianaceae)

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ABSTRACT

The genus *Eustoma* is treated as having two partially sympatric species: a widespread, small-flowered, *E. exaltatum*; and a more restricted, large-flowered *E. russellianum*. In spite of their extensive overlap, hybrids between the two are only rarely detected in natural populations, or inferred but rarely from among numerous sheets on file at TEX. The Mexican species, *E. barkleyi* Shinners, is treated as but a form of *E. exaltatum* [**f. barkleyi** (Shinners) B.L. Turner, **forma nov**. Maps showing distributions of the several taxa are provided. Published on-line **www.phytologia.org** *Phytologia 96(1): 7-11 (Jan. 8, 2014)*. ISSN 030319430

KEY WORDS: Gentianaceae, *Eustoma*, USA, Mexico

EUSTOMA Salisb.

Annual to short-lived perennial herbs to 80 cm high. **Leaves** simple, opposite, sessile, often clasping, glabrous, more or less glaucous, ovate to linear-lanceolate. **Flowers** showy, borne on long pedicels, terminal and solitary or paniculate. **Calyx** deeply cleft, the lobes attenuate, erect, glabrous. **Corolla** deeply campanulate, the lobes large, erect, glabrous, purple to lavender, pink to white. **Stamens** 5 or 6, inserted on the corolla throat; anthers versatile, linear, yellow. **Styles** erect, slender, glabrous; stigmas broadly 2-lobed, their upper surfaces densely and minutely glandular-pubescent. **Capsules** ellipsoid, 2-valved, glabrous. Seeds minute, numerous, reticulate, more or less globoid. **Base chromosome number**, x = 18.

Eustoma, as treated here, is a genus of only two species, in spite of the considerable synonymy listed for each. It is typified by **E. exaltatum** Salisbury, Paradiscus Londinensis, *t. 34* (1806), as noted by Shinners (1957).

Key to species

1. Corolla lobes mostly 2.5-5.0 cm long, 20-30 mm wide; calyx lobes mostly 1.5-2.5 cm long ..... **E. russellianum**
1. Corolla lobes mostly 1.5-2.5 (3.0) cm long, 5-15 mm wide; calyx lobes mostly 1.0-1.5 cm long... (**2**)

2. Leaves mostly lanceolate, 2-6 mm wide, 5-12 times as long as wide; northeastern Mexico..... **E. exaltatum f. barkleyi**
2. Leaves mostly ovate to ovate-lanceolate, 6-15 mm wide, 2-5 times as long as wide; widespread..... **E. exaltatum**

EUSTOMA EXALTATUM (L.) Salisb. ex G. Don, Gen. Hist. Dichlam. Plants 4: 211. 1837.
Arenberia glauca Mart. & Gal.
Chlora exaltata (L.) Griesb.
Dupratzia scoparia Raf.
Erythraea plumieri H.B.K.

Eustoma chironioides (Benth.) Griesb. in DC.
Eustoma exaltatum f. *albiflorum* Benke
Eustoma exaltatum var. *albiflorum* Cham. & Schlech.
Eustoma selenifolium Salisb.
Lisianthus exaltatus (L.) Lam.
Lisianthua glaucifolius Jacq.
Urananthus glaucifolius (Jacq.) Benth.

This species, and that which follows, is well described by numerous workers in many floras (e.g. Correll & Johnston 1970; Munz, 1965; etc.), and I see little need to add or subtract from such parameters. Indeed, the above generic description should suffice for both **E. exaltatum** and **E. russellianum**, the key to species gives the only characters that seem to differentiate between the two. Indeed, in the Illustrated Flora of North Central Texas (Shinners and Mahler, 1999), the two species are combined, but with reservation, awaiting the definitive work of yet others. After study of the two taxa, both in the field and in herbaria, I conclude that specific status for both is warranted.

According to a USDA website (ARS: 1995. Germplasm Resources Information Network): **E. russellianum** is native to the southern United States south to Mexico; while **E. exaltatum** is native to the southern United States, Mexico, Central America, and the West Indies. "The two species may represent different ecotypes of the same species, for both species are inter-fertile and produce fertile progeny." In cultivation, **E russellianum** is said to be a biennial, and first produces a rosette which bolts into a single flowering stem after cold treatment, then dies after branching. In contrast, **E. exaltatum** grows more like a perennial and produces additional shoots each season. Both species have purple flowers that are funnel-shaped to campanulate, but the corolla lobes of **E. exaltatum** range up to 2.5 cm in length, whereas those of **E. russellianum** are 5 to 6 cm in length; most of the material in cultivation is said to belong to the latter species. According to the relative few chromosome reports available, both species are diploid with n = 32 chromosomes.

The biological assessment of the ARS seems sound, except that I would recognize the "ecotypes" as species, as noted below.

It should be emphasized that the two taxa are broadly sympatric. In spite of this, they are only rarely found growing together, presumably because of edaphic factors (heavy saline or clay soils, mostly occurring in water-logged soils or seeps in **E. exaltatum**; sandy-clay or calcareous soils along stream sides in **E. russellianum**); indeed, putative hybrids between these are apparently rare, strongly suggesting that they are deserving of specific status, instead of infraspecific status for **E. russellianum**, as bestowed by Kartesz (1999).

Richardson and King (2011) provided an excellent account of the species as it occurs in southern Texas, including a colored photograph from Willacy Co. (pers. comm.).

Shinners (1957) noted that white-flowered forms of the species occur, the earliest given varietal recognition by Chamisso and Schlechtendal in 1831, as noted in the above synonymy.

EUSTOMA EXALTATUM f. BARKLEYI (Standl. ex Shinners) B.L. Turner, **forma nov.**
Based upon *Eustoma barkleyi* Standl. ex Shinners, Southwestern Naturalist 2: 39. 1957.
Type: **MEXICO. COAHUILA:** "inside hot springs enclosure," Ojo de Caliente [33 mi SW of Monterrey], *Hernandez et al. 16M548* (Holotype: TEX!).

Shinners, in his original description, aptly noted:

> The open branching and very narrow leaves make this [taxon] very distinct in the genus whose species are separated only by vegetative and size differences. It is allied to *E. exaltatum* in its small flowers.

Shinners further noted that **forma barkleyi** is apparently restricted to northeastern Mexico and that it appears to intergrade with **E. exaltatum,** this "presumptive evidence" that natural hybridization between the two occurs. I toyed with the idea of accepting specific status for the taxon, noting that the two leaf forms may occur at the same site (e.g. Coahuila: 19 km SW of Cuatro Cienagas, *Chaing et al. 7645* [TEX, both mounted on the same sheet], but the degree of sympatric intergradation between the two leaf forms and their lack of geomorphological integrity (cf. Fig. 1), has led me to reduce *E. barkleyi* to the status of forma w/o much ado. Apparently K.N. Gandhi of Harvard University took the same view, having annotated all such leaf forms at TEX as **E. exaltatum**.

Interestingly, a single collection from among the hypothetical hybrid populations from Cameron Co., Texas, discussed under **E. russellianum**, below, possesses the approximate leaf shape of **f. barkleyi** (*Runyon 5098*, TEX), which suggests that ancestral hybridization between the two species might have given rise to **f. barkleyi**.

Amongst the synonymy, above and below, it will be noted that numerous color-forms have been described for the two species, and I have observed additional leaf shapes among collections of **E. exaltatum** that I opted not to describe.

EUSTOMA RUSSELLIANUM (Hook.) G. Don ex Sweet, Hort. Brit. ed. 3: 473. 1839.
Bilamista grandiflora Raf.
Eustoma andrewsii (Hook.) G. Don ex Sweet
Eustoma exaltatum subsp. *russellianum* (Hook.) Kartesz
Eustoma gracile A. Gray
Eustoma grandiflorum (Raf.) Shinners
Eustoma grandiflorum **f.** *album* (Holz) Waterf.
Eustoma grandiflorum **f.** *bicolor* (Standl.) Shinners
Eustoma grandiflorum **f**. *fisheri* (Standl.) Shinners
Eustoma grandiflorum **f.** *flaviflorum* (Cockerell) Shinners
Eustoma grandiflorum **f.** *roseum* (Standl.) Shinners
Eustoma russellianum **f.** *bicolor* Standl.
Eustoma russellianum **f.** *fisheri* Standl.
Eustoma russellianum **f.** *flaviflorum* Cockerell
Eustoma russellianum **f.** *roseum* Standl.
Eustoma russellianum var. *flavum* A.M. Davis
Eustoma russellianum var. *gracile* A. Gray
Lisianthus russellianus Hook.
Urananthus russellianus (Hook.) Benth.

As to description of this species, and its geomorphological relationship with **E. exaltatum**, see above. Its distribution is shown in Fig. 3. It should be noted that I have not seen collections of **E. russellianum** from Mexico; most such reports by others have been based upon unusually large flowered specimens of, otherwise, typical **E. exaltatum**.

Enquist (1987) provides an excellent, colored, close up of the corolla of **E. russellianum**; note its contrast with the smaller flowered, **E. exaltatum** (Richardson & King 2011).

Many of the forms listed in the above synonymy are probably the result of occasional natural hybrids between *E. exaltatum* and *E. russellianum*, this exemplified by a number of such forms occurring in easternmost Texas (e.g., Montgomery Co.: Willis, *Fisher s.n.* (TEX), this also the county from which the Types of both **forma bicolor** and **f. roseum** were obtained). Especially noteworthy are a number of seemingly intermediates and hypothetical backcrosses between the two species in southernmost Texas (Cameron Co.), where the two species apparently occur together in heavy clay or sandy loam soils (16 sheets assembled by 9 or more collectors over the years 1923-1967, most of these identified as one or the other species, but at least one bearing the name of *E. russellianum* var. *flavum* A.M Davis, the holotype

(TEX) reportedly collected in a recent delta area of that county by its collector, the type not located by Shinners, nor does it exist among the type specimens of that herbarium today.

ACKNOWLEDGEMENTS

First and foremost, I would like to thank Dr. G. N. Gandhi of Harvard Univ. for providing the publication date of **E. russellianum**, thus preempting by several months or more that of *E. grandiflorum,* the latter used by my ex-mentor, Lloyd Shinners. Thanks to Jana Kos for editorial assistance and to Matt Turner and Paul Waller for observations and collections from two large populations of **E. russellianum** in north central Texas. Distribution maps are largely based upon specimens on file at LL-TEX, SRSC, and various other reports in the literature, including the USDA website, that appeared reasonable to the present author.

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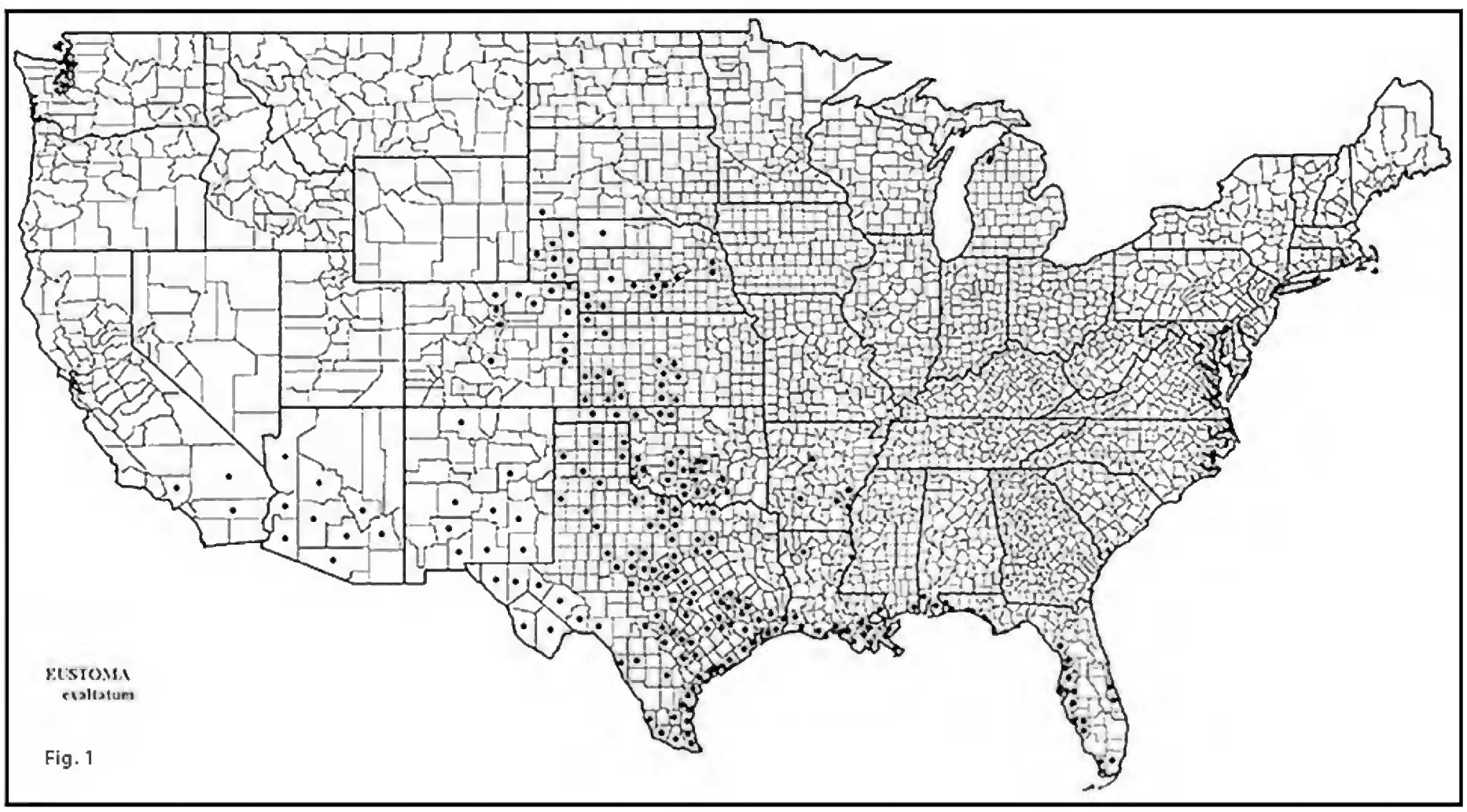

Fig. 1. Distribution of *Eustoma exaltatum* in the USA.

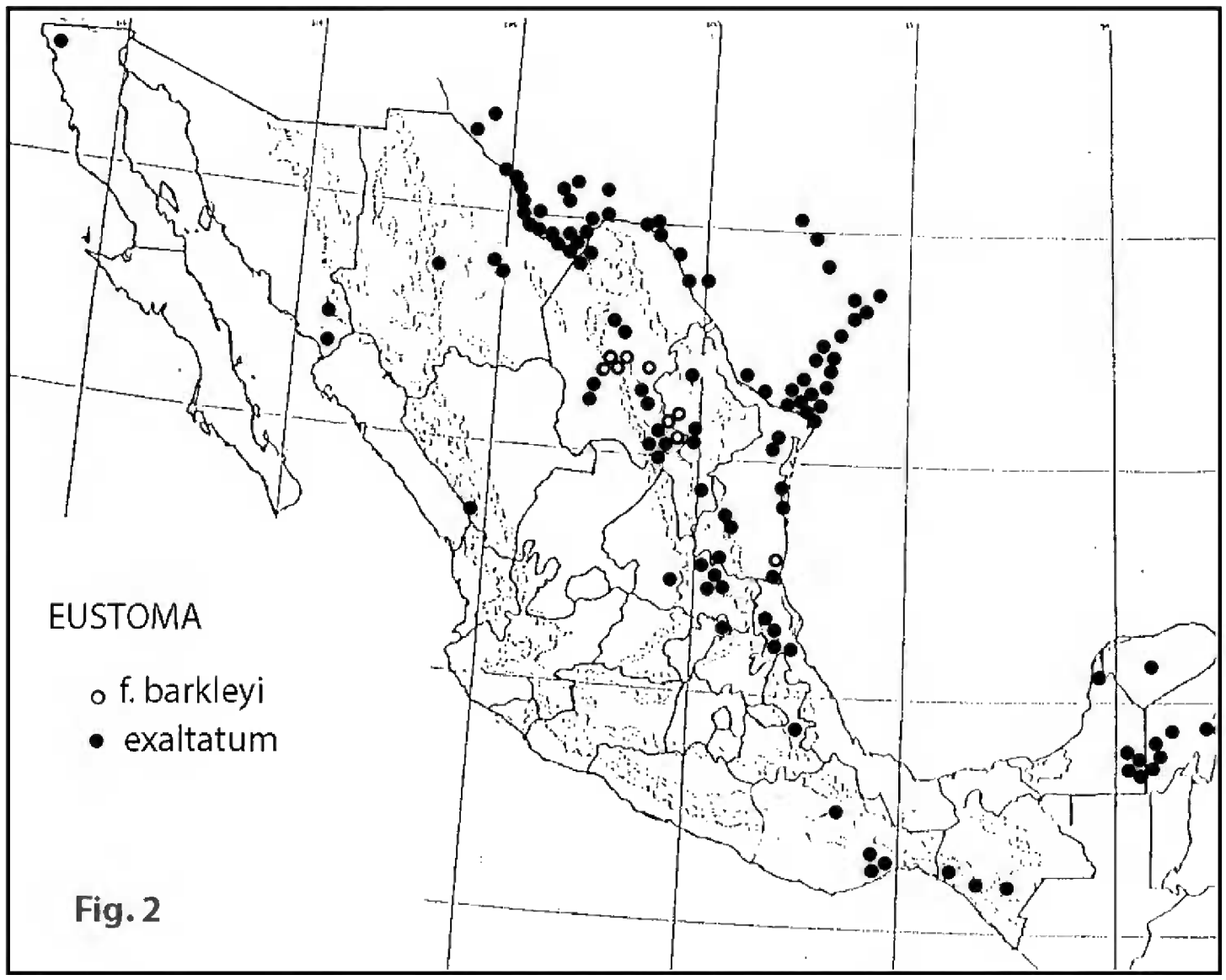

Fig. 2. Distribution of *Eustoma exaltatum* and *E. e.* f. *barkleyi* in Mexico.

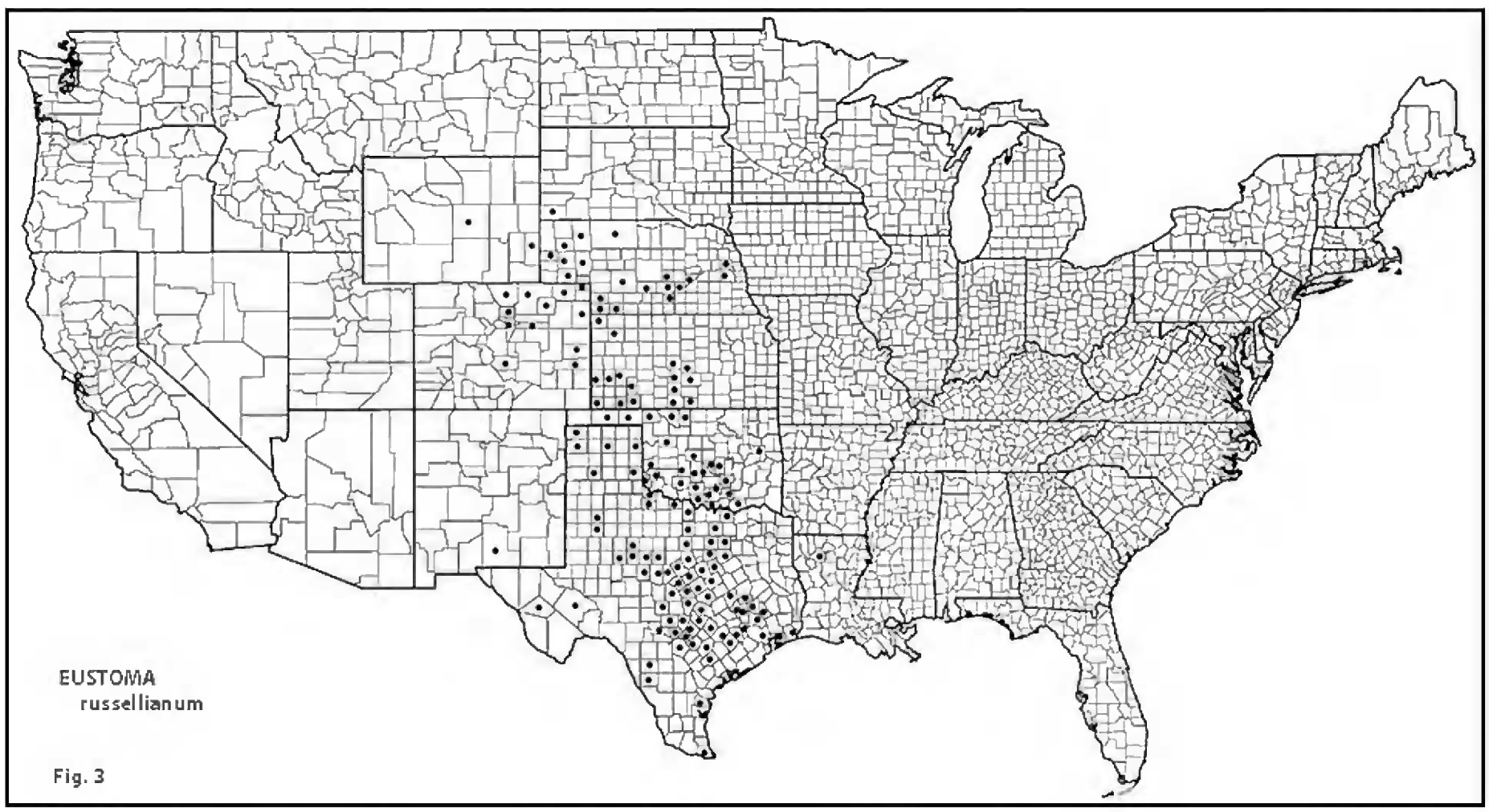

Fig. 3. Distribution of *E. russellianum*.